science

language arts

Energy Expedition

Objective

To introduce students to the concept of energy and teach them about its connection to trash.

Activity Description

Students will complete the *Energy Expedition* worksheet individually or in pairs.

Materials Needed

- One photocopy of the *Energy Expedition* worksheet per student
- One pencil or pen per student

Key Vocabulary Words

Potential	Combustion
Fossil	Methane
Coal	Solar
Gas	Water
Trash	Oil

Duration

1 hour

Skills Used

Reading
Problem solving

Activity

Step 1: Distribute one copy of the *Energy Expedition* worksheet to each student. Introduce the concept of energy—what it is, what it's used for, and where it comes from. Next, discuss the link between energy and trash; explain how we can capture methane gas from landfills to burn as energy for the community or local businesses. In addition, discuss how we can capture energy by burning our trash in combustion facilities. Refer to the Teacher Fact Sheets titled *Landfills* on page 155 and *Combustion* on page 159 for background information.

Step 2: Depending on student ability levels, use the Teacher Answer Key to go over the key vocabulary of this activity in advance, discussing each word and its meaning with the class. This will help them correctly complete the written activity later.

Step 3: Direct students to complete the *Energy Expedition* worksheet, working either individually or in pairs.

Journal Activity

Have students keep an energy diary for one week. Ask them to record every time they use energy in a day (for example, turning on lights, using a car or bus). Where could they have saved energy (for example, riding a bike instead of using a car)?

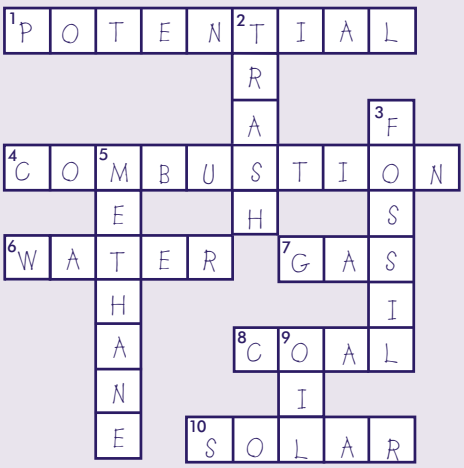
Assessment

1. Collect the *Energy Expedition* worksheets and assess students' work.
2. Ask students to list at least four different sources of energy.

Enrichment

1. Visit a waste-to-energy facility as a field trip. Have students write summaries that explain how the facility works.
2. Divide the class into groups and assign them each an energy concept (such as those introduced in the *Energy Expedition* worksheet.) Ask each group to conduct research on their topic and prepare a presentation to teach the class about their findings.
3. Conduct a spelling bee using the energy words featured on the *Energy Expedition* worksheet.

Crossword Puzzle Key

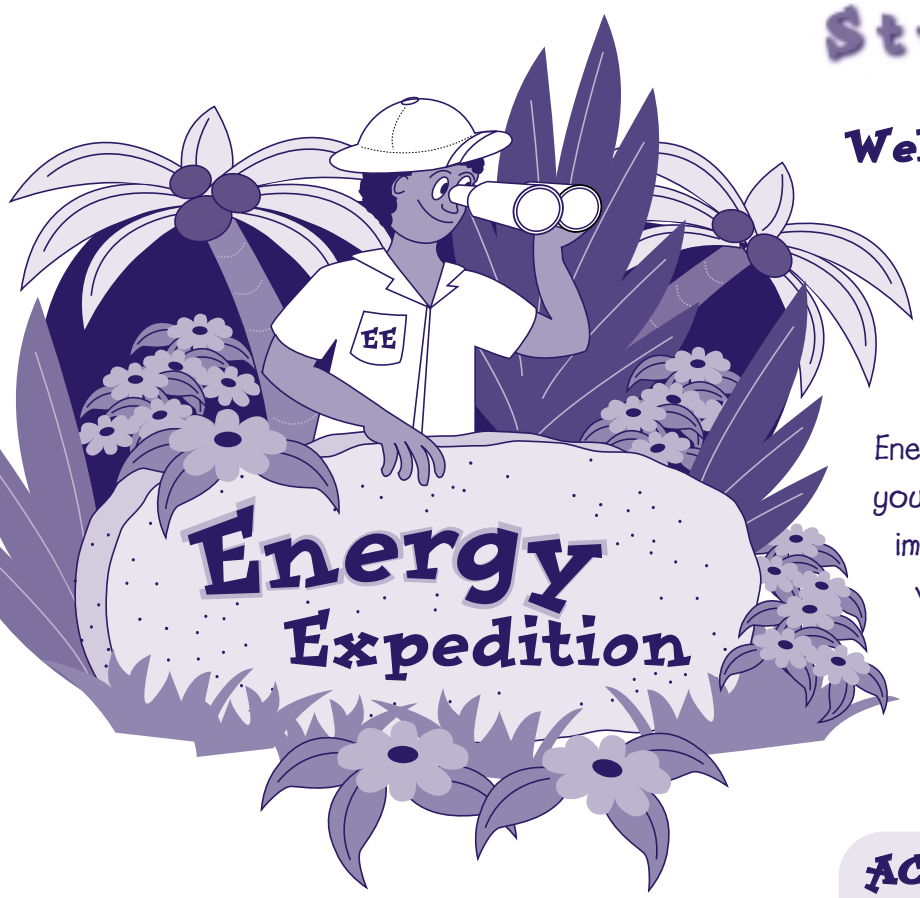


ACROSS

1. A type of energy. The word describes something that's "possible, but not certain." potential
4. The process of burning a material or substance. It's another word for "incineration," and its letters might "bust!" combustion
6. A liquid that we can control and direct to generate energy. You might drink it or swim in it. water
7. A substance that is neither liquid, nor solid, but can be removed from the Earth and used to generate power. gas
8. A hard, black substance that we burn for fuel. coal
10. A word describing energy from the sun. It rhymes with "polar." solar

DOWN

2. It's another word for unwanted material that you throw out into a container every day. You might set it out on the curb or throw it in a dumpster. trash
3. The hard rock-like remains of prehistoric animal and plant life, such as dinosaurs, which we sometimes discover in the Earth's crust. fossil
5. A natural gas that is generated by garbage decomposing in a landfill. Live animals can produce this gas as well...such as a cow burping! The word ends in "ane," but it's not "propane." methane
9. The liquid that we pump from the Earth's surface to burn for fuel. This work also applies to a product we often use in cooking. oil

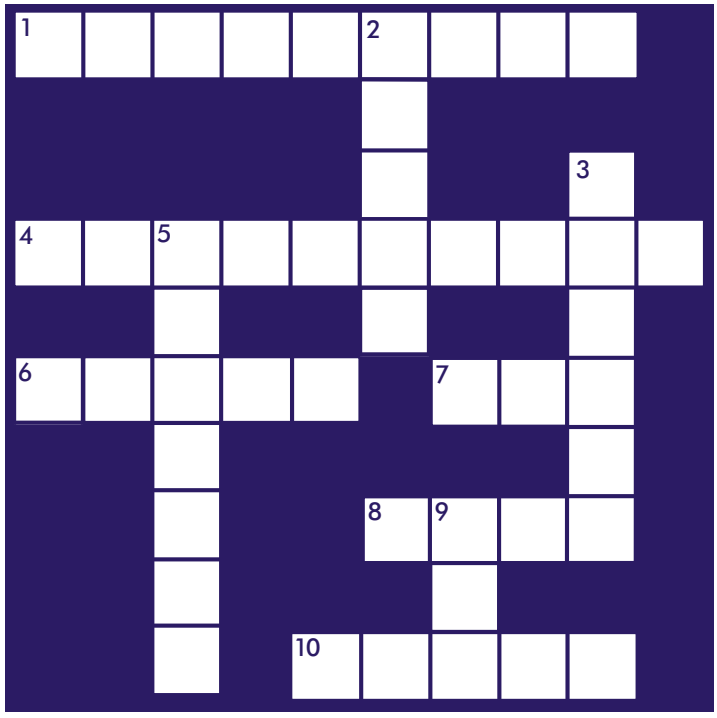


Welcome Energy Explorer!

You're about to set out on a mission to investigate ENERGY, including its uses, sources, and connection to our trash. If you accomplish your mission, you'll be promoted to an Energy Expert—and you'll be able to help your family and friends understand how important energy is to them and their way of life. This mission is not easy, however, and it will take all of your concentration and effort to crack the energy mystery. Good luck!

Name:_____

Directions: Your first task is to complete the Energy Crossword Puzzle below using the clues provided. Once you have filled in the crossword puzzle, you'll have a list of ten important energy vocabulary words.



ACROSS

1. A type of energy. The word describes something that's "possible, but not certain." _____

4. The process of burning a material or substance. It's another word for "incineration," and its letters might "bust!" _____

6. A liquid that we can control and direct to generate energy. You might drink it or swim in it. _____

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2. It's another word for unwanted material that you throw out into a container every day. You might set it out on the curb or throw it in a dumpster. _____

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9. The liquid that we pump from the Earth's surface to burn for fuel. This word also applies to a product we often use in cooking. _____

Energy Story

Directions: Great job! You've now learned ten important energy vocabulary words! Read the story below to learn more about energy and become an Energy Expert. You must determine which of your ten vocabulary words goes in each blank. Remember, some words will be used more than once. After you have filled in all of the blanks, you'll have successfully completed your energy mission!

What is ENERGY?

Energy is one of the most important parts of our world—it makes things happen. Energy means the "ability to do work." Did you know that you use energy every day? Every time you flip a light switch on; use hot water; or ride in a car, bus, train, or plane, you are using energy. Each time you watch TV or use a computer, you are using energy. All of the clothes that you wear, toys you play with, and food you eat are products made from processes that require energy.

There are two different types of energy:

- Energy that is stored is called _____ energy.
- Energy that is moving is called kinetic energy.

Let your pencil rest on your desk. Right now, if it's not moving, your pencil has_____**(same as previous blank)** energy. Now, tap it lightly so that it rolls across your desk. Since it's moving, the pencil now has kinetic energy.

Where does ENERGY come from?

There are many different sources of energy on Earth and there are many different ways that we can tap into those sources and make the energy work for us—creating power, electricity, and heat.

One source of energy upon which we rely heavily are_____ fuels. How were these fuels formed? Millions of years ago, ancient plants absorbed the energy from the sun and converted it into more plants. Ancient animals, like dinosaurs, ate the plants and converted the plant's energy into body mass. When the animals and dinosaurs died, their remains collected in the ground, and, over millions of years, decomposed into a source of fuel.

What are some_____ **(same as previous blank)** fuels? Coal, oil, and natural gas are three important fuels that are derived from the Earth and the stored energy of organic remains.

_____ started out as a spongy, brown material called "peat," which consists of the decomposed organic matter of ancient animals and plants. Geologic forces buried the peat deep under the Earth's surface, where it was further packed down by heat and pressure. The compressed peat was eventually converted to_____**(same as previous blank)**.
We burn_____ **(same as previous blank)** to heat our homes and run electrical machinery. About 20 percent of the energy we use comes from _____**(same as previous blank)**.

_____ is formed deep within the Earth's surface in rocks that are fine-grained and rich in the organic remains of once-living animals. The oldest_____**(same as previous blank)** -bearing rocks date back more than 600 million years. _____ **(same as previous blank)** is burned to fuel vehicles and heat homes. About 45 percent of the energy we use comes from _____**(same as previous blank)**.

Natural _____ is a colorless, odorless fuel produced by drilling into the Earth's crust where it was trapped hundreds of thousands of years ago. Once it is brought to the surface, it is refined and purified to remove water, other gases, and sand. Next, it's transported through large metal pipelines that span the continent. Natural _____ **(same as previous blank)** is used for heating, cooling, and the production of electricity.

How is ENERGY connected to trash?

While these sources of energy continue to serve us well, they are known as nonrenewable resources that will eventually be used up. Once we use all of our supplies, we will have to depend on new sources of energy. We're already looking for new energy sources so that we can conserve those that come from within the Earth. That's where_____ comes in. Did you know that you can get energy from _____**(same as previous blank)**? There are two ways that we can use our_____ **(same as previous blank)** to make energy.

In one method,_____**(same as previous blank)** is taken to a waste-to-energy facility. These facilities burn the _____ **(same as previous blank)** during a process called_____. This process generates heat that can be converted to fuel and electricity. Waste-to-energy facilities take a large amount of trash and make it smaller by burning it. This reduces the amount of trash that piles up in our landfills, which is better for the environment.

A second way for us to use trash for energy involves the garbage that we dispose of in landfills. As this trash decomposes, it produces _____ gas. Too often, this valuable source of energy is not used. Now, however, over 150 landfills in the United States are using the gas, captured by a special pipe system set up in the landfill, to generate electricity; provide fuel for factories, schools, and other facilities; and to produce natural gas for general distribution.

Are there any other sources of ENERGY?

In addition to using the energy we generate from our garbage, there are other ways we can harness the renewable energy sources that surround us. Here are two other important energy sources that we are just beginning to use in place of fossil fuels.

The light that comes to the Earth from the sun is pure energy. Nearly all other sources of energy originally got their energy from the sun. Organic matter, like plants, convert _____ energy into leaves, flowers, and fruits. We can also use energy from the sun to heat our homes and buildings with special _____ **(same as previous blank)** panels that capture and convert the light into energy.

Hydroelectric power is generated by harnessing _____. When _____ **(same as previous blank)** falls or runs downhill, it can be used to run turbines or large water wheels at mills and factories, which generate electricity.

Now you understand how our trash can help us generate power and electricity. In addition, you've learned all about our use of energy on this planet and the many different sources we can turn to for energy use in the future.